CRUISE REPORT: LAKE ONTARIO

76012

TUG ARGUE MARTIN, Captain Robert Fontaine

LAKE ONTARIO

19-30 April, 1976

Scientific Crew:

Deborah R. Hutchinson, Chief Scientist - U.S.G.S., Univ. of Toronto

Sandra Conley - U.S.G.S.
Michael Kirkmann - U.S.G.S.
Charles Paull - U.S.G.S.
Ken Parolski - U.S.G.S.
Phil Shea - U.S.G.S.
Richard Sylwester - U.S.G.S.
Jeffrey Pferd - NYSGS

Coordinators (not present at sea)

James F. Davis - NYSGS
Paul W. Pomeroy - NYSGS
Richard J. Wold - U.S.G.S.
Henry Halls - Univ. of Toronto (supervisor)

INTRODUCTION

The Lake Ontario cruise of the ARGUE MARTIN grew from a proposal to investigate the possible continuation of the Clarendon-Linden fault structure in western New York into Lake Ontario (Fig. 1). Marine seismic profiling was used (i) to determine the areal extent of the structure in the lake, and (ii) to delineate major structural features in the bedrock and any near surface features in the overlying sediment that could indicate recent movement on the fault.

Active data collection was restricted to a daytime operation; base ports were the Rochester Port Authority (New York side) and Cobourg harbor (Ontario side). Windy weather conditions (greater than 15 mph) curtailed the operation for 4½ out of nine available days. Two additional days were allotted for travelling to and from Rochester and loading and off-loading the ARGUE MARTIN.

Total track length measures 440 km with seven perpendicular crossings of the main proposed extension of the fault structure (10-15 km spacing) and at least nine perpendicular crossings of proposed adjoining fault structures, as indicated in Fig. 2.

Equipment included:

(i) Uniboom

(ii) 1" Airgun

(iii) 20" Airgun

(iv) 7 kHz Sonar Transducer

(v) 4 channel Sony Tape Recorder

(vi) Proton Magnetometer

(vii) 2 EPSCO (Loran C) receivers

Major equipment malfunctions were essentially repairable while conducting the survey. These included:

(i) Unadjusted ship's compass - repaired by a Mr. Kake of Toronto (23 April).

(ii) Compressor hose rupture - unsuccessfully jury rigged with epoxy, (21 Apr.), then repaired with the appropriate high pressure fitting (22 Apr.).

(iii) Broken 7 kHz transmitter (in transit to Rochester) - repaired 23 Apr., then broken again after Line 23 (29 Apr..) and not repaired for the rest of the cruise (Lines 24-29).

Daily Narration

19 April, Mon.: All participating scientists met in Rochester, N.Y. A preliminary meeting was held to explain cruise objectives, watch-stander responsibilities, etc.

20 Apr., Tues.: Load and test equipment

All equipment was loaded and secured. Several short lines run outside the Rochester harbor. Checked the equipment operation. Equipment tested was: the Uniboom, 1" Airgun, magnetometer, LORAN C Epsco receivers, the Raytheon and EPC recorders. The Uniboom signal was much cleaner on the Raytheon rather than the EPC recorder. The 7 kHz transmitter and ship's compass were not functioning properly.

21 Apr., Wed.: Lines 1-6 completed

The Uniboom and magnetometer operated all day; both LORAN receivers traced within tenths of microseconds of each other. The compressor blew a hose fixture after Line 1; it was temporarily and unsuccess-fully repaired with epoxy. Jeff Pferd remained in Rochester to arrange hotels, customs duties, etc.

22 April, Thurs.: In Port (Rochester): Stormy weather

The compressor high-pressure fixture was repaired plus the small compressor was loaded onto the ARGUE MARTIN. The LORAN receivers began reading 10 microseconds apart on Dana (SS7-Z), both consistently locking on the fixes. Jeff Pferd and I visited the University of Rochester, Dept. of Geology to investigate their work on the lake. The relevant professors were away; therefore, we collected reprints and used the library.

23 April, Fri.: In Port (Rochester): High winds

In the morning, Jeff Pferd and I visited the land outcrops on the lake shore he had investigated relating to the Clarendon-Linden fault structure. Field stops included the Paleozoic Trenton Formation in North Hamlin, the sand deposits of Devil's Nose Point in Hamlin Beach State Park (the extrapolated intersection of the fault structure from land to lake) and a gravel pit southeast of Devil's Nose Point (Fig. 2). The ship's compass was adjusted by Mr. Kake of Toronto in the afternoon. The 7 kHz transmitter was repaired and tested at the dock.

24 April, Sat.: Lines 7-12 completed

Clear day with low winds. Phil Shea returned to Woods Hole. Systems operating were the Uniboom, 1" Airgun, 7 kHz, Magnetometer and the tape recorder (recording the 1" Airgun). The 20 inch Airgun was tested; its signal was less clear than the 1" Airgun and Uniboom interference was more pronounced. The 1" Airgun was therefore returned to operation.

25 April, Sun.: In Port (Cobourg)

John Bowlby, a PH.D candidate at Queen's University, Kingston, Ontario, studying the Kingston Basin in Lake Ontario, met with ARGUE MARTIN and discussed his work and research on the Lake with us. He led Jeff Pferd, Charlie Paull, and myself on a field trip through Prince Edward

County on the north shore where Liberty (1960) had mapped the faults correlatable with the Clarendon-Linden Structure. Field stops included (i) an old spit feature by Lake Biddy and (ii) road outcrops from Picton to Point Petre (Fig. 2).

26 April, Mon.: Lines 13-18 completed

One section of the airgun tape was replayed at three different filter settings in the morning (in port). John Bowlby returned to Kingston. In the afternoon, a skeleton crew operated the Uniboom, the 7 kHz and LORAN C in protected waters east of Cobourg.

27 April, Tues.: In Port (Cobourg): gusty and windy

The airgun tape for Lines 7-12 was replayed in near entirety at different filter settings. Dick Sylwester worked with the technicians on familiarity with the equipment.

28 April, Wed.: Lines 19-20 completed

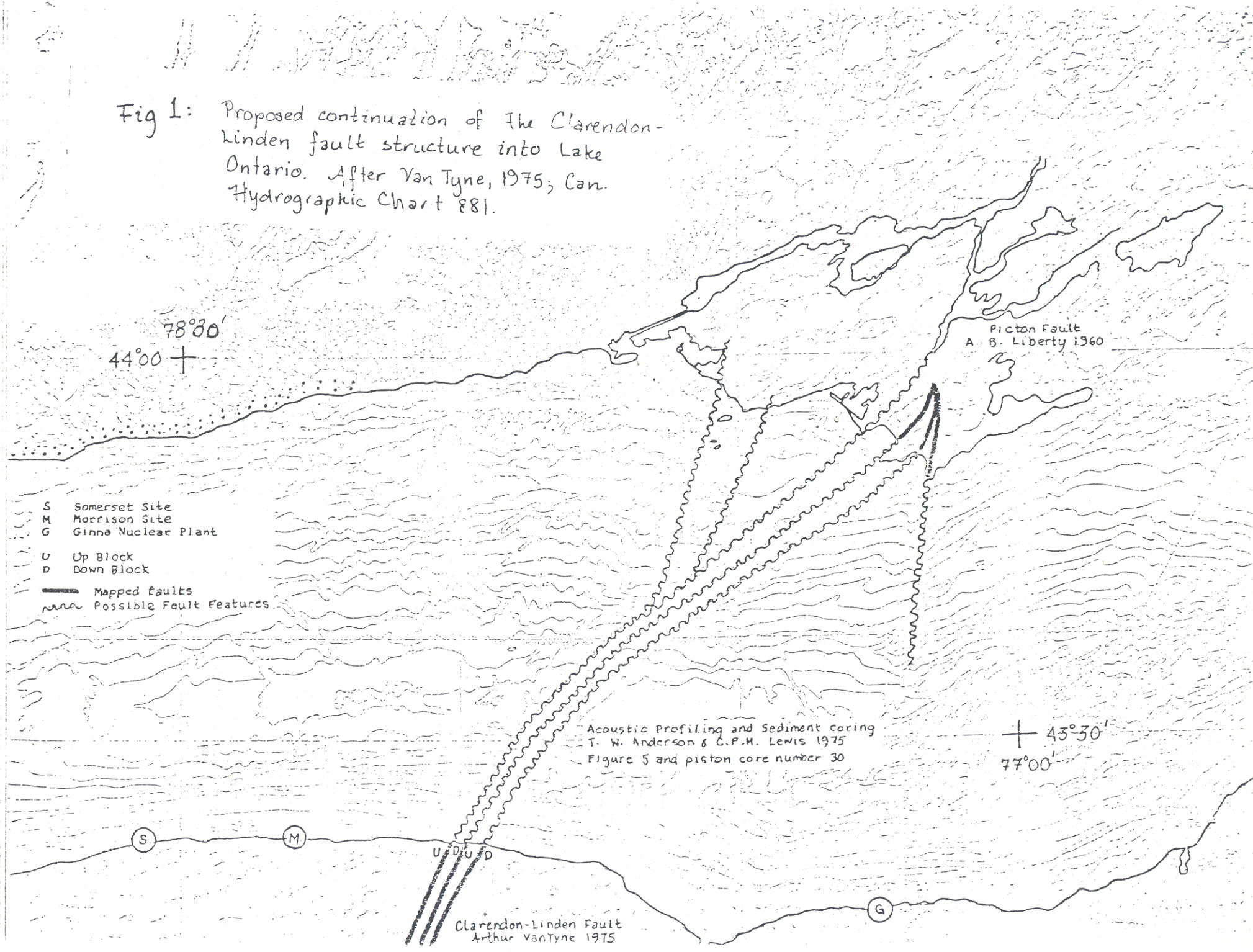
The ARGUE MARTIN left Cobourg in borderline weather conditions. All equipment functioned (Uniboom, 1" Airgun, 7kHz, Magnetometer, LORAN C). The Sony tape recorder had a board changed allowing the Uniboom, as well as Airgun, signals to be recorded. Seas had built to 3-4 ft. by 1600 EST; the compressor threatened to break its weld in the rolls. All gear was pulled and secured for a return to Rochester.

29-30 April,Thurs/Fri.: Lines 21-29 completed

Beautiful clear day. Systems working were the Uniboom, 1" Airgun, Sony tape recorder, LORAN C, and Magnetometer; the 7 kHz operated through Line 23 when the transmitter broke. The malfunction was not detected by the end of the cruise. To finish the necessary lines, operations continued through the night.

30 April, Fri.: Offload the ARGUE ARTIN

Fig 1: Proposed continuation of the Clarendon-Linden fault structure into Lake Ontario. After Van Tyne, 1975; Can. Hydrographic Chart 881.



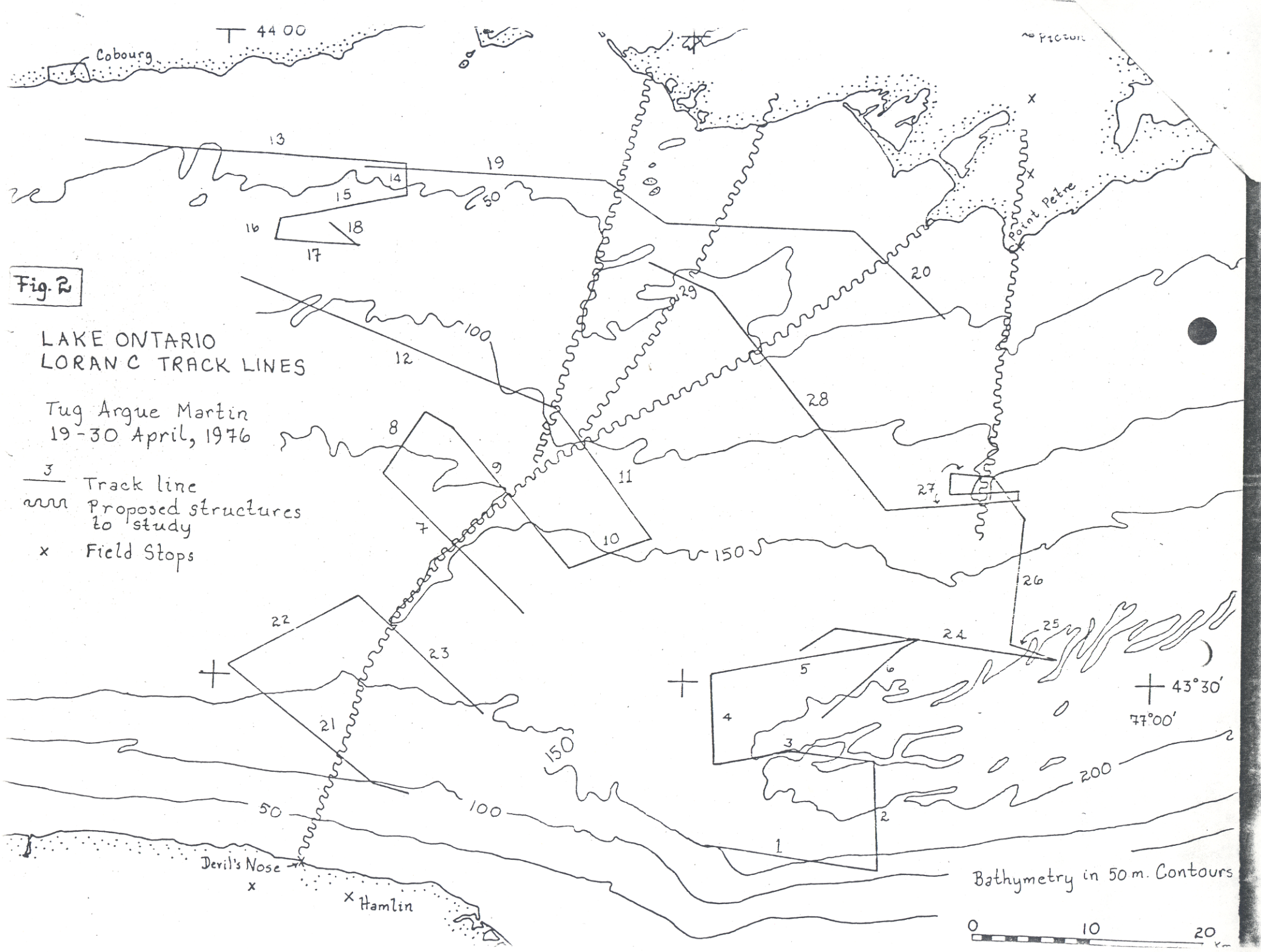


Fig. 2
LAKE ONTARIO
LORAN C TRACK LINES
Tug Argue Martin
19-30 April, 1976
3 Track line
Proposed structures to study
x Field Stops
Cobourg
44 00
Point Petre
Devil's Nose
Hamlin
43°30'
77°00'
Bathymetry in 50 m. Contours
0 10 20 Km

Data Synopsis

21/04/76

	Length (km)	Uniboom	Track airgun	Magnetometer	Sony Tape airgun	Sony Tape Uniboom	7kHz
Line 1	15.5	✓	✓	✓			
2	9.7	✓		✓			
3	14.5	✓		✓			
4	7.9	✓		✓			
5	18.5	✓		✓			
6	10.9	✓		✓			
TOTAL (km)	77.0	77.0	7.5	77.0			

24/04/76

Line 7	17.5	✓	✓	✓	✓		✓
8	6.4	✓	✓	✓	✓		✓
9	8.6	✓	✓	✓	✓		✓
10	7.7	✓	✓	✓	✓		✓
11	13.8	✓	✓	✓	✓		✓
12	30.0	✓	✓	✓	✓		✓
TOTAL (km)	84.0	84.0	84.0	84.0	84.0		84.0

26/01/76

	Length (km)	Unibeam	Larsh airgun	Magne-tometer	Sony Tape		TELLA
					Bergen	Unibeam	
Line 13	28.0	✓					✓
14	30	✓					✓
15	11.1	✓					✓
16	1.8	✓					✓
17	7.4	✓					✓
18	3.5	✓					✓
TOTAL (km)	54.8	54.8					54.8

28/01/76

Line 19	68.2	✓	✓	✓	✓	✓	✓
20	11.0	✓	✓	✓	✓	✓	✓
TOTAL (km)	79.2	79.2	79.2	79.2	79.2	79.2	79.2

29/01/76

Line 21	19.7	✓	✓	✓	✓	✓	✓
22	12.8	✓	✓	✓	✓	✓	✓
23	14.7	✓	✓	✓	✓	✓	✓
TOTAL (km)	47.2	47.2	47.2	47.2	47.2	47.2	47.2

29 - 30/04/16

	Length (km)	Uniboom	1 inch airgun	Magne-tometer	Sony Tape		7 kHz
					Airgun	Uniboom	
Line 24	23.2	✓	✓	✓	✓	✓	
25	4.4	✓	✓	✓	✓	✓	
26	10.8	✓	✓	✓	✓	✓	
27	39.5	✓	Part	✓	✓	✓	
28	24.0	✓	✓	✓	✓	✓	
29	6.3	✓	✓	✓	✓	✓	
TOTAL (km)	98.2	98.2	91.0	98.2	98.2	98.2	

Entire Cruise:

Lines 1-29	440.4	440.4	311.9	381.6	308.6	224.6	265.2
miles:	238 mi	238	168	206	166	121	143

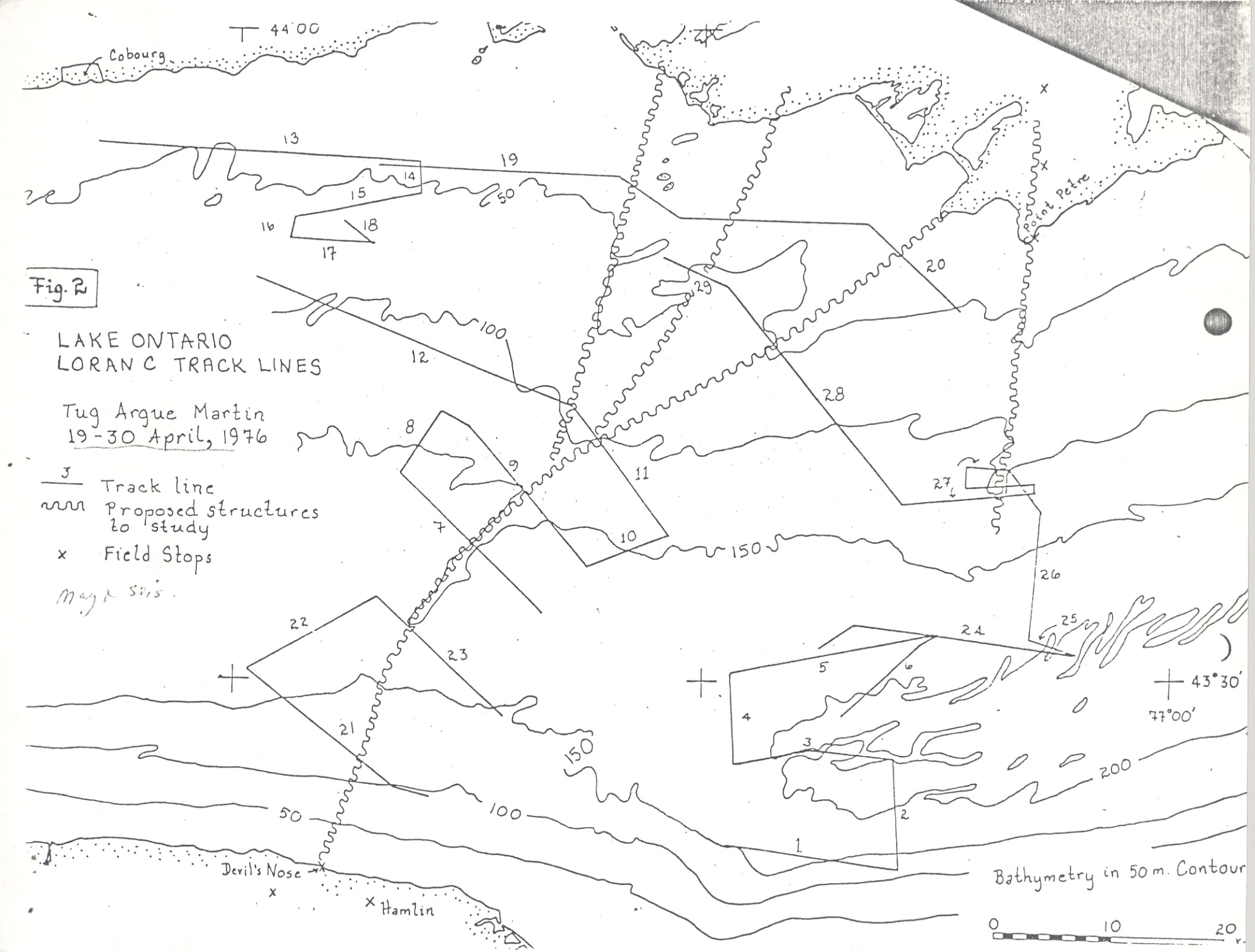


Fig. 2

LAKE ONTARIO
LORAN C TRACK LINES

Tug Argue Martin
19-30 April, 1976

3 Track line

Proposed structures to study

× Field Stops

Mag & Sris.